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See Important Notice on Page 49.

. . THE OPTICAL . .

# MAGIC LANTERN

JOURNAL

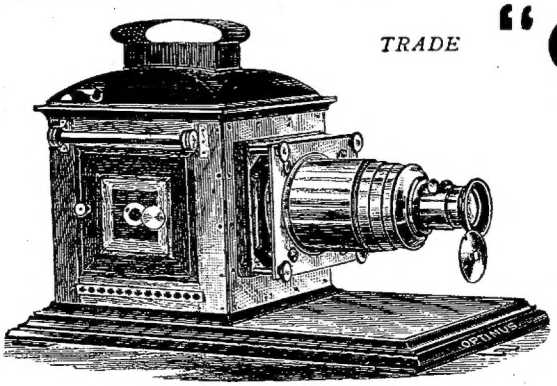
And Photographic Enlarger.

*A Magazine of Popular Science for the Lecture-Room and the Domestic Circle.*

WITH WHICH IS INCORPORATED THE "LANTERN WORLD."

EDITED BY J. HAY TAYLOR.

Vol. 12.—No. 144. MAY, 1901. [Entered at Stationers' Hall.] Price 2d., Post Free 3d.

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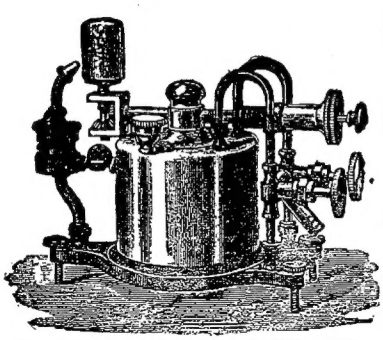

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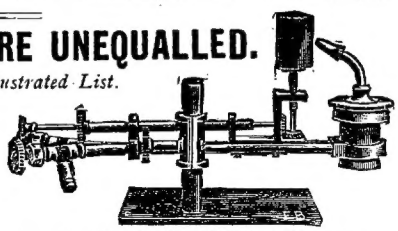

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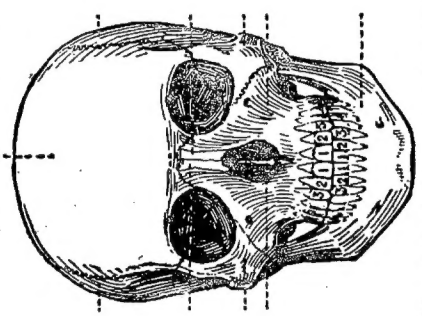

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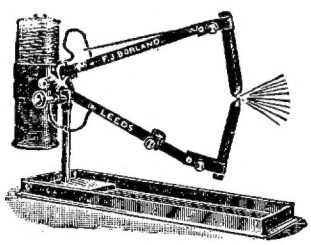

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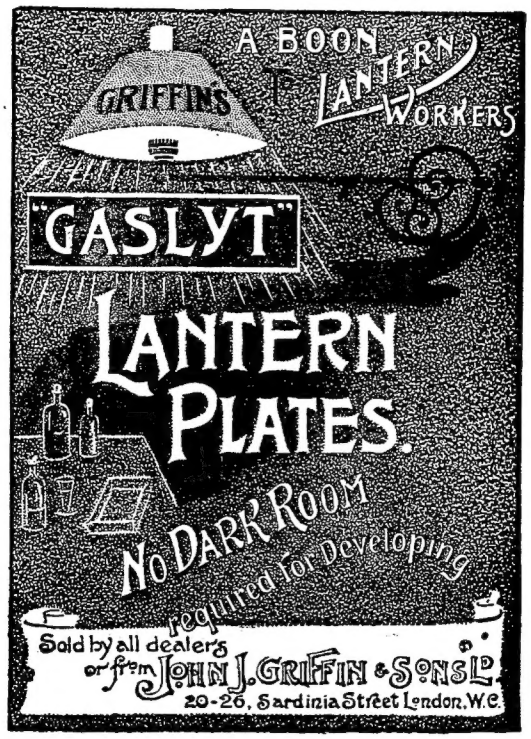

WITH WHICH IS INCORPORATED THE "LANTERN WORLD."

Vol. 12.—No. 144. MAY, 1901. *Price* **2d.**, *Post-free* **3d.**

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## NOTICES.

THE *Optical Magic Lantern Journal and Photographic Enlarger* is issued on the 1st of each month during the Lantern Season, October to March, price Two Pence, and may be obtained from all Newsvendors, Railway News Stalls, Photographic Dealers, or from the Publishers, at the following rates, post free:—

Per Annum, 1/6. United States, 40 cents.

EXCHANGE Column, General Wants, &c. (not Trade)—First 20 words, 6d.; and for every 3 additional words, 1d.

**SMALL ADVERTISEMENTS** must reach the office not later than the first post on the 24th of the month. All cheques and postal orders to be made payable to the Magic Lantern Journal Company, Limited.

**EDITORIAL** communications must be addressed, **THE EDITOR.** Advertisements and business communications to **THE MAGIC LANTERN JOURNAL COMPANY, Limited, 9, Carthusian Street, London, E.C.**

American Agents:—The International News Co., 83 and 85, Duane Street, New York City.

## IMPORTANT ANNOUNCEMENT.

OWING to the recent changes in the lantern trade, this Journal will in future be published during the lantern season only, *i.e.*, from October to March inclusive.

Since the advent of cinematographic work, which is now carried on mainly in music and kindred halls as one item of a varied entertainment, the ordinary lantern business has greatly decreased. Firms which have hitherto lent us their support throughout the entire year are now unable to do so, owing to the cinematograph and film business being practically in the hands of three or four controlling firms. It is to be hoped that by the time the next issue is published, *i.e.*, October 1st, the trade in general will revive.

Subscribers will please take notice that the date of their expirations will be duly extended.

THE MAGIC LANTERN JOURNAL CO., LTD.

## EDITORIAL NOTICE.

I WOULD call attention to the intention of the Directors of the Magic Lantern Journal Co., Ltd., as above stated. All business letters should be addressed to the Company during the recess, and as I shall not attend at the offices until the Autumn, I append my residential address for the benefit of my numerous private and other correspondents:—

J. HAY TAYLOR,
Bleak House, Wightman Road,
Hornsey, London, N.

## NOTES.

**Photographic Convention.**—The Council of the Photographic Convention of the United Kingdom announce that the members of L'Union Internationale de Photographie have decided to hold their annual gathering at Oxford simultaneously with their Convention. This meeting will take place at Oxford from July 8th to 13th. Full particulars may be obtained from the hon. sec., Mr. F. A. Bridge, East Lodge, Dalston Lane, London.

**Photographic Continental Excursions.**—Under the auspices of the South London Photographic Society, several excursions have been arranged to take place on the Continent. The leader is Mr. W. F. Slater, 5, Firs Parade, High Road, Lee, S.E., to whom all communications should be addressed.

**Mr. T. E. Freshwater,** who has spent the whole of his business life in the service of Messrs. Newton & Co., has lately been admitted as a partner in this firm. Mr. Freshwater has been well known to the trade as one of their managers for some years past.

**Pity the Poor Lantern Operator.**—A fashionable member of society, when about to give a lecture, engaged the services of an operator, who was to supply his lantern outfit and exhibit a series of slides, the sum agreed upon being 15s.; but after the lecture only 10s. was paid, 5s. being deducted because the operator did not supply a reading lamp for the lecturer. The case came into Court, when the operator got judgment for the amount claimed. We shall next hear that the operator will be expected to supply cushions for the reserved seats and refreshments for the lecturer. Perhaps under these circumstances he may get as much as a guinea fee.

**Lantern Slides of Royalty.** — Messrs. Newton & Co., of 3, Fleet Street, have made an arrangement with Messrs. W. & D. Downey, of Ebury Street, by which they have obtained the sole right to publish as lantern slides the principal copyright photographs of that celebrated firm. These pictures, which have never been allowed to be sold as slides before, comprise the new photograph of His Majesty The King and Her Majesty Queen Alexandra, taken recently by special command. These were published on the 15th ult. as paper photographs by Messrs. W. & D. Downey, and on the same day as lantern slides by Messrs. Newton & Co. They also include a series of the Royal photographs taken during many years past by Messrs. Downey, and their well-known art studies.

**Thornton-Pickard Hand Camera.**—The Thornton-Pickard Manufacturing Company have just introduced what they term a "Focal plane hand camera." This camera has many novel points, amongst them being one method of opening up the camera, for the pressure of a spring catch both opens the camera and brings the front into position. This camera closes up by simply folding up the baseboard.

**Royal Photographic Society.**—H.M. The King has expressed his willingness to become a patron of the Royal Photographic Society. Her late Majesty Queen Victoria had been a patron of this society for thirty-seven years.

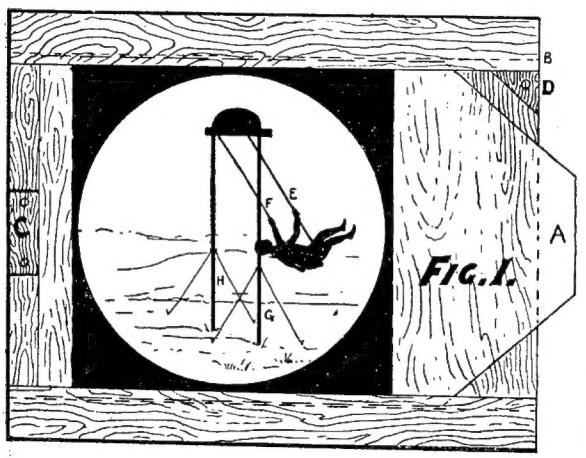
**E. G. Wood's Business.**—In last issue we stated that Mr. Halsey had purchased this business; we should have said Mr. Horsey. The business is to be continued under the original name of E. G. Wood.

**Secco Films.**—Secco Films (British and Colonial), Limited, which came in with a flourish of trumpets last year, is being wound up. The failure is attributed to insufficient working capital, the attempt to issue £5,000 debentures not being successful. The total deficiency to the share subscribers is over £88,000.

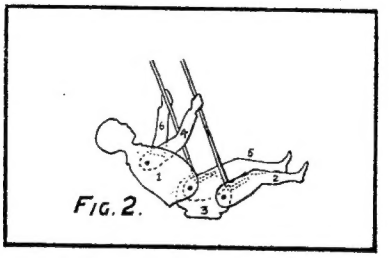
**Bromley Cottage Hospital.**—Mrs. Feiligrath Kroeker will give a reading entitled "True Fairy Tales from My Garden" for children, from her new and original stories, at the Bromley Grand Hall, on Wednesday, 15th inst., at 8 p.m. The lecture will be illustrated by lantern pictures, and the proceeds will be devoted to the Bromley Cottage Hospital.

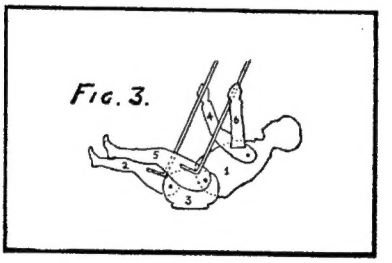
THE construction of this slide enables the operator at the lantern to put the figure through all the evolutions of swinging by the simple backward and forward movement of a sliding glass working in a groove made in the framework. A wooden framework of the ordinary size is employed. A portion of the back can be removed when required by withdrawing one or two screws. A glance at Fig. VII. will explain, but I shall refer to this again presently.

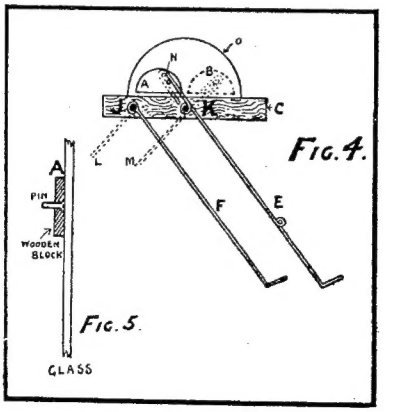
On what will be the fixed glass is glued a block C (Fig. IV.), bearing two pins J and K. Two lengths of wire, E and F, are cut off and bent round into the shape shown, and then pivoted to J and K.




It will be noticed that E has a loop in the middle and a larger one at the top end. Above the block C is painted in dead black a semi-circle O, the purpose of which is to hide the movement of the block A, to which I shall refer again. On this glass is also painted the two upright supports of the trapeze or swing, care being taken to paint G a little lower than H, to give the proper perspective. If these supports are placed in the position shown in Fig. I., when the model is worked the figure will appear to pass between the two posts as it swings to and fro. A few lines should be drawn upon the fixed glass to represent the ground. The body and head of the man are cut out of thin metal, and the legs and arms, also of thin metal, are pivoted to the body in the manner shown in Figs. II. and III.




A careful reference to the last two mentioned Figs. will show clearly the order in which the different parts of the figure are to be fastened together. Fig. II. shows the front view, whilst Fig. III. shows the back view. It will be seen that the hand of the arm 6 is soldered to the wire E, but the other end is left free; thus it

works independently of the other parts of the body.

The arm marked 4 is pivoted to the loop in the wire E and to the body. The leg 5 is soldered to the wire F and pivoted to the body as well, whilst the other leg 2 is pivoted to the hip 3 and soldered to the wire E. The constructions of this figure may seem at first sight somewhat difficult, but the reader, if he compares the two diagrams, will find everything explained.

It is obvious that as the wires E F, representing the ropes, move in their proper course, the distance between the various points at which the different parts of the body are pivoted will vary, causing the desired movements of the swinger. When this part of the work has been carefully done the reader may turn his attention to the sliding glass A (Fig. I.), which is cut to the shape shown, and which slides freely in the grooves, B B, its movement being limited by the stop blocks C and D.

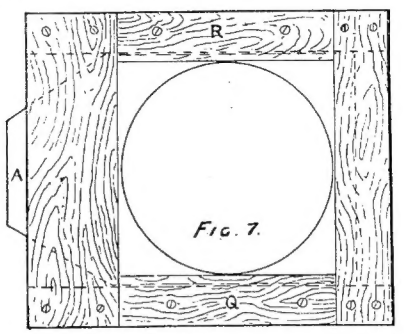


FIG. 7. FIG. 8.

On glass A a small wooden block is fastened by means of glue—a sectional view of this is given in Fig. V.—and to the block is fixed a pin, consisting of a screw with the head filed off flush with the surface of the wood. This block is also shown in Fig. IV. Reference now being made to Fig. VII., we have here a view of the back side of the slide. The portions R and Q are fixed by means of screws and are therefore detachable. Their inner edges are bevelled off as shown in the sectional view (Fig. VIII.), so that the glass on which the model is mounted may be easily removed; a convenience in case any one part should happen to get out of order.

When the fixed glass P has been properly fitted up, the block, Q or R, is taken off, and the glass carrying the block A (Fig. IV.) slipped into the groove. It is important to observe that the actual glueing on of the block carrying the pin is left to the last moment, so that the pin may be placed into its proper position before the glue on the block has entirely set. The detachable block, which has been removed, may then be replaced, when the slide is ready for use.

When it is placed in the lantern for exhibition, the sliding glass is pulled half-way out, so that the figure appears to be at rest; then it is pushed in and out, with a gradual increase in the distance of each successive movement. When it has reached the limit set by the two blocks it is kept at the same rate for a few moments, then gradually slowed until the swinger is once more at rest.

## *Blue Lantern Slides.**

By BASIL DONSETT.

THE most important point of all is to clean the glasses thoroughly. These may be either patent plate or other good cover glasses purchased new, or they may be old lantern slides cleaned off. If they are the latter, my *modus operandi* is as follows :—

I take the slides and, placing them in a grooved washing trough so that they are kept separate from one another, I allow them to soak for 24 hours in cold water. I then prepare a solution of washing soda—½ lb. to the quart of boiling water—and put the slides in this one at a time until they are all covered. They remain in this for a quarter of an hour or more until cool, when they are taken out one at a time, scrubbed on both sides with an ordinary scrubbing brush, and rinsed in cold water. They may then be dried and treated in the subsequent operations just as new glasses.

The new glasses are rubbed over with a tuft of cotton wool moistened with a cream made by mixing whiting to a suitable consistency with water 1 ounce, alcohol (not methylated) 1 dram, ammonia 2 drops. This is smeared over both sides, and the plates stood in a rack until dry. Two clean cloths are then taken. With the first as much as possible of the whiting is wiped off, giving particular attention to the edges, and then with the other the glass is well polished and stood in the rack to await coating. Care must be exercised not to finger the glass after cleaning.

A levelling table is next required. Mine is very simple, and is made afresh every time it is used. Three French nails are driven into a working bench 2 or 3 inches apart until they stand firmly, making a little triangular tripod.

* "Exchange" in the *Photo-American*.

## GENERAL ADVERTISEMENTS.

A PROFESSIONAL lanternist and cinematographist of great experience is open to engagements, with or without his own apparatus, in town or country, on very moderate terms. Reference, Editor of this Journal. —Address, Optics, 13, York-street, Walworth, London.

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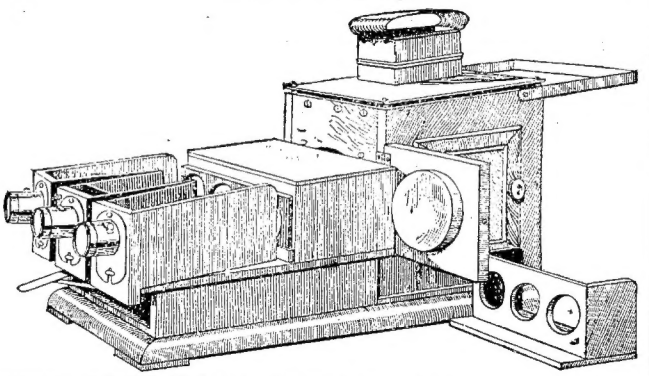

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On the heads of these a lantern plate is placed and levelled with a spirit level. Get the level right from one nail to another first by hammering one of them in as required, and when this is done get the level from one of these to the remaining nail, taking care not to alter the two first levelled, but to adjust by the third. When this has been done, a plate placed on the three nails ought to show itself perfectly level no matter what the direction of the level may be. The operation of levelling need not take more than 2 or 3 minutes if done systematically in this manner. If it is done haphazard, knocking in first one nail and then another, it is possible to drive all three nails home a bit at a time, and never once have the plate level while so doing.

I take an ounce of Nelson's X opaque gelatine, as sold for soup making, and soak it in cold water for an hour. It is then taken up, the surplus water drained off, and put in a pint jug, which is filled up to the top with boiling water. The gelatine at once dissolves. Some absorbent cotton wool—to be bought at any druggist's—is made into a loose tuft, wetted, and placed in a glass funnel, and a little boiling water poured through to warm the funnel. The funnel is then placed in a bottle holding over a pint—I use an ordinary whisky bottle—and the gelatine solution filtered through the cotton wool. This is greatly assisted by placing bottle and funnel down close to the fire, so that the gelatine does not set. When filtered it is put in a clean jug and is ready for applying to the glasses. To do this it

**must not be too warm.**

but should be at about 100 to 120 degrees Fahr. There is no need to use a thermometer, as it is easy to tell whether the temperature is right by the way in which the coating flows. If it is difficult to coat the glass without the gelatine setting, the solution is too cold. If it runs too freely and takes a long time to set it is too warm.

To coat the glass it is taken and balanced on the thumb and first and second fingers of the left hand, and the jug of gelatine solution being in the right hand, a pool as big as half-a-crown is poured into the centre of the glass. A bowl or dish should be at hand, and after tilting the glass to allow the gelatine to run into each corner in succession, the surplus should be quickly tipped off into the dish, and the plate placed on the nails to set. There must be nothing like draining attempted, but merely the excess almost jerked off. If there are two or three levelling stands all the better, as some more plates may be coated while the first sets. As soon as the gelatine on the glass has solidified to a jelly, it may be put in a rack to dry. The place where the glass dries must be quite free from dust and "blacks," which will quickly spoil an otherwise excellent plate.

All these operations, I need hardly point out to my readers, may be performed in broad daylight, the more the better, and are extremely simple. It has been suggested that it is a good deal easier to use ordinary lantern plates, unexposed and not developed, simply fixed out, washed, and dried. It is certainly less trouble, but I have never succeeded in this method in getting good vigorous slides free from irregular markings, so I prefer not to do so, but to coat my own plates with gelatine.

The plates when once coated may be kept indefinitely, and do not in any way deteriorate. They should not be sensitised until a few days before use, as when once they have been they soon go off in quality.

To sensitise them take red ferric ammonium citrate 220 grains, and dissolve it in 2 ounces of water. 150 grains of

**potassium ferridcyanide**

are in like manner dissolved in 2 ounces of water. The two solutions are mixed and passed through a filter of absorbent cotton. I use a dish made by fastening four strips of beading with marine glue on a sheet of plate-glass 7 by 7 inches, and coating the corners with Brunswick black. The dish holds four lantern plates with a minimum of solution; the 4 ounces described will be far more than is necessary. In this dish, then, the four plates are put face upwards and covered with the sensitiser, the dish being rocked for 5 minutes. This operation must not be performed in daylight, but gas or lamplight, and plenty of it, may be used. At the end of 5 minutes the plates are leaned up against the wall on a piece of blotting paper to drain, and are then put in a rack and shut up in a dark cupboard until dry. The drying ought not to take more than 4 or 5 hours, and probably will not do so if the cupboard is in a warm room and is not too small.

Printing is performed under a negative by contact, just as a P.O.P. print is made. It must be done by daylight, and will take about twice as long as an ordinary gelatine chloride print takes from the same negative. I use the nearest negative I have got as an actinometer. Taking a few narrow strips of P.O.P., I put the negative in a printing frame with one of the strips behind it, and put this beside the frame in which I am printing my lantern slide. When

the strip is fully printed I substitute another, and when the second is done I know my lantern slide is finished. An image is visible upon it, and can be seen by opening the printing frame at the back, but I prefer to work entirely with this simple form of actinometer.

Nothing remains but to develop the slide by immersing it in cold water, in which it may be left until the image is fully out. If the slide has been a trifle over-printed it is reduced by being left in the water overnight. I prefer, however, not to do this, but to develop it under a tap of running water. It speedily takes on a fine blue tone, which although I have heard it said is not permanent, I have not discovered to be wanting in this respect. Some slides I made in 1891 in this way are still as vigorous as the day on which they were produced. I prefer to use a little acetic acid (1 drop per 2 ounces) in the last washing water, as it brightens up the colour considerably.

## *The Development of Lantern Slides.*

By T. PERKINS.

THERE is a certain amount of difficulty in determining the correct exposure for lantern slides whether they are made by contact or reduction. If one has a dozen slides to make from the same number of negatives great difference in the exposure may be necessary on account of the different densities and colour of the negatives, and it by no means follows, even if one is fortunate enough to hit on the correct exposure for the first, that this will indicate, without the chance of failure, the correct exposure for the second.

I have lately made some hundreds of slides for lecture purposes from negatives taken at wide intervals of time, developed in very different ways, and as I did not wish to have as many failures as successes, I hit on a plan which has reduced the number of failures to a minimum. I may say that all the subjects were architectural, in which a considerable variety of colour in the slides is not only allowable but desirable, and though one aims at a black colour for a building such as Exeter Cathedral Church, and a red one for such a church as that at Lichfield, with various shades of brown for most subjects, yet if we get Exeter a little too warm and Lichfield a little too cold, the slides if otherwise good are not rendered worthless on account of their not being quite of the ideal colour aimed at.

My method of proceeding is to mix up two cups of developer, one the normal developer for cold tones (I have lately been using some most convenient and economical ready-made solutions, prepared by Mr. Baynton, of New Street, Birmingham, from a formula by Mr. Harold Baker), and another which will give warm tones, provided a long enough exposure is given, owing to the addition of a certain amount of a combined solution of bromide of ammonium and carbonate of ammonium—one ounce of each dissolved in twenty ounces of water. The more of this that is added to the normal developer for black tones, if it is somewhat diluted with water, and a longer exposure given, the warmer will the tone become.

My method of using is as follows:—I give a full exposure, so as to make certain of not losing a slide from under-exposure, and pour on the developer calculated to give warm tones. In this the image appears slowly in any case; but if from the fact that after several minutes have elapsed without any image at all appearing, I conclude that the exposure has

**been insufficient**

for this developer, I pour it off, and apply the other made for producing black tones. This never fails to start development. If the image comes up too quickly the plate goes back into the re-strained bath, and it may be that it can be finished in it; but it may be necessary once more to apply the other solution to urge on development once more. By skilfully alternating the two developers an excellent slide may be produced, and its tone will lie between those that would be produced by each of the two developers if used alone.

It may be asked what must be done should it be found that the slide has received too long an exposure even for the re-strained bath in which it is first placed? This is not very likely to occur; but the difficulty may be met, should it occur, by having ready for use a third developer, containing a still larger proportion of the bromide and carbonate of ammonium.

It must not be supposed that a fresh mixing of developer is required for each plate; there are few developers used for slides in which at least half a dozen plates may not be developed in succession. My practice is to prepare two ounces of the re-strained developer and one of the stronger one. Two slides are generally developed together in the former in a half-plate developing dish, and if necessary they are taken out one at a time to be put into the forcing

solution. Of course, if a cold black tone is desired, then a much shorter exposure is needed, and the plate must not be put into the re-strained developer at all; but a cold black tone is seldom needed, and when it is one must risk the exposure, and if it is not correct try again.

## *Lantern Slide Hints.*

THERE is no more delightful way of making positives from the negatives we have called into existence during the summer than to prepare lantern transparencies of them, because a photograph looks its best in lantern-slide form (the detail and gradation cannot be reproduced so well in any other way). The work may be done at evening-time, and the evening's work finished off in an hour, or in several hours, according to the number of slides we can spare leisure to make. Lastly, the slides may be used to entertain our friends as well as ourselves when projected, and are just as good as prints for exhibition to visitors around one's table. Indeed, the (to ladies especially) novel idea of a photograph on glass adds interest. "I cannot think, you know," exclaims the fair one who is being entertained, "how you do them on glass."

There is nothing particularly difficult about slide-making, and the plate-maker's instructions, supplemented by one of the excellent manuals on the subject, ought to make smooth the path of the veriest beginner. I am therefore going to give here only a short series of notes touching points which may arise in the reader's mind before he purchases his first box of lantern-plates or after his first attempts. Should they appear fragmentary, I beg the reader's indulgence. Without repeating much which can be found in every text-book, I want to anticipate what questions or difficulties may arise.

A lantern plate is of so much thinner glass than the negative plate that it is easy to make a mistake and put the glass side next the negative. Here is an infallible test: Breathe on the plate on the side you believe to be the glass. If you are right you will see a dew on the glass; if the film side is uppermost there will be none, the gelatine absorbing the moisture of your breath.

What Plate to Use.—Begin with a slow plate, such as Thomas's, Mawson & Swan's, Cadett's, Edwards's Special, or England's Rapid Chloride. The fineness of grain in a slow plate is generally better, there is greater latitude in exposure, and a brighter and more comfortable yellow light can be used. Indeed, Thomas's plates (and the others too, no doubt) may be developed in the shadow of some screen cast by ordinary gas or lamplight, but direct light fogs them. Fix on one plate and stick to that.

Reduction or Contact. — Unless your negatives are 3 inches square (or less in area) you will not be able to include the whole on the lantern plate; hence the reduction process, in which the negative is virtually copied in the camera on the lantern plate. Reduction means (1) much more trouble, (2) a rapid lantern plate, and (3) very often a less desirable pictorial result, for many hand camera pictures are all the better for being sliced down liberally; therefore I advise contact.

Which Developer.—I prefer pyro-ammonia, which gives better colour and greater transparency in the image than other more popular developers.

A.

| | | |
|---|---|---|
| Pyro .. .. .. | 2 grains | 4½ gms. |
| Potass meta-bisulphite | 6 grains | 14 gms. |
| Ammonium bromide .. | 2 grains | 4½ gms. |
| Water .. .. .. | 1 ounce | 1,000 c.c. |

B.

| | | |
|---|---|---|
| Liquid ammonia (·880) | 8 minims | 14 c.c. |
| Water .. .. .. | 1 ounce | 1,000 c.c. |

Use equal volumes of A and B.

This gives a very pleasing warm black to brown tone, according to the plate. Care must be taken not to overwork it, or it stains. It is best not to use it twice, and as it is weak in pyro, it is not expensive to do this.

Strong black tones are obtained with the following hydroquinone formula:—

A.

| | | |
|---|---|---|
| Hydroquinone .. .. | 8 grains | 18·5 gms. |
| Soda sulphite .. .. | 44 grains | 100 gms. |
| Potass bromide .. .. | 2 grains | 4·5 gms. |
| Citric acid .. .. | 3 grains | 7·0 gms. |
| Water .. .. .. | 1 ounce | 1,000 c.c. |

B.

| | | |
|---|---|---|
| Caustic soda .. .. | 8 grains | 18·5 gms. |
| Water .. .. .. | 1 ounce | 1,000 c.c. |

Use A, 1 volume; B, 1 volume; water, 2 volumes.

This solution may be used several times. One ounce will develop four to six plates. The colour is a cold bluish-black.

Fixing.—Use an acid bath. The simplest is made by throwing some meta-bisulphite of potassium into the ordinary fixing bath when hypo is being dissolved; or commercial acid baths (*e.g.*, Griffin's acid-hypo) are very suitable.

FLAT NEGATIVES.—If you have a flat negative, expose for a rather shorter time, and develop in the hydroquinone developer given above, but without the water. Let development go on till image has disappeared. After fixation and rinsing, reduce in Farmer's reducer (ferricyanide and hypo), applied with cotton-wool. Surprisingly good results may be obtained thus from over-exposed or fogged negatives.

HARD NEGATIVES.—Develop the slide with a weaker developer (more water) than that given in the formula. If hard and chalky on the screen, reduce with a 2½ per cent. solution of persulphate of ammonia, which reduces the intensity of the dark parts without (at first) altering the half-tones and high lights.

Another method of softening down hard slides is to tone by Piper's process. This tones the slide in addition to "softening" it. Prepare:—

| | | |
|---|---|---|
| Potass bichromate | .. 10 grains | 20 gms. |
| Hydrochloric acid | .. 5 drops | 10 c.c. |
| Water .. .. | .. 1 ounce | 1,000 c.c. |

Bleach the fixed and well-washed slide in this, place in a weak solution of potassium meta-bisulphite for a few minutes, until the yellow stain has gone, wash and dry. Expose to light for a day or two to fix the colour, which is a warm brown. In place of the hydrochloric acid, use 5 grains (12 gms.) of potass bromide (or iodide) and 5 drops (10 c.c.) of nitric acid, the process being otherwise exactly the same. The first gives a cool, grey tone; the second, a brown.

MOUNTING.—Always make your slides perfectly dry by warming them before binding up. This means greater permanency, and may avoid possible melting in the electric lantern. Do not try to use the commercial circles, domes, and oblongs for masking. Cut up slips of black paper, and, moistening one side with the tongue or a pad, lay on the slide; they will adhere to the gelatine surface, and any size and shape of rectangular opening may be produced. The secret of putting on binding strips so that they will not come off is to rub the edge thoroughly well down before the sides.—*The Bazaar.*

## *Piracy of Copyright Lantern Slides.*

PROFESSOR HERMANN, *alias* Edmund Leatham Wright, of 122, Grey Rock Street, Liverpool, was recently summoned at the Liverpool Police Court in respect of four informations for infringement of copyright. The charge was that of unlawfully selling copies of copyright photographic slides without the consent of the owner. The complainant, Mr. James Bamforth, of Holmfirth, was represented by Mr. Fletcher (Messrs. Kidd, Meller, and Fletcher, solicitors, Holmfirth); and the defendant was represented by his brother, Thomas Wright, who was recognised in Court, and at the request of the Bench went into the box.

Mr. Fletcher said that his client had suffered severely through the continued piracy of his work. Mr. Bamforth was well-known throughout the country for his artistic work in connection with the production of lantern slides made by himself from living models; the slides being used for public entertainments. Eleven years ago, the present defendant had been summoned on a similar charge, but the proceedings were withdrawn on a suitable apology being made, and an arrangement for the payment of the costs in the case. Only a portion of those costs had, however, been paid, as the defendant constantly changed his addresses and could not be traced. Mr. Bamforth had been unable to find who were the authors of the pirated works for a considerable time. The present charges were based on copies of scenes illustrative of one of G. R. Sims's stories, which had been traced to the defendant, who carried on business in a number of towns under various names, including:—"Hughes," 72, Biddulph Street, Leicester; "Guy," 29, Low Chore, Chester-le-Street, Durham; and also at the following addresses: 1a, White Rock Street, Liverpool; and 45, Beechwood Road, Litherland.

Mr. Bamforth then gave evidence that he was the owner of the copyright of the four slides in question, which illustrated G. R. Sims's story, "One Winter Night." He described the slides, and produced certificates of the registration, and also the defendant's apology in the previous proceedings.

J. R. King, of Long Eaton, gave evidence as to purchasing the four slides from the defendant at one of his Liverpool addresses, 122, Grey Rock Street. He had been dealing with the defendant for several months, and had bought a few hundred slides from him not knowing they were pirated.

In reply to the Bench, witness stated that he bought the slides in question acting under Mr. Bamforth's instructions.

Harry Knight, in the employ of Messrs. Archer & Sons, Liverpool, gave evidence as to defendant's brother (now in the box) attempting to hire Mr. Bamforth's slides at his employers' shop, but Mr. Archer, suspecting the purpose for which the slides were wanted, declined to loan them.

Defendant's brother, in reply to questions, admitted that Professor Hermann's proper name was Edmund Leatham Wright, and that he (witness) was present when his brother (the defendant) signed the apology eleven years ago at the office of Mr. Bamforth's solicitor. He said they had not copied many of Mr. Bamforth's slides lately, as they were now copying views.

The Bench inflicted a fine of £8, and £1 6s. 6d. costs in each of the four cases, making a total of £37 6s. for the defendant to pay.

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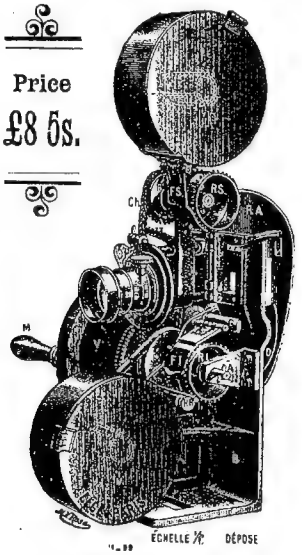

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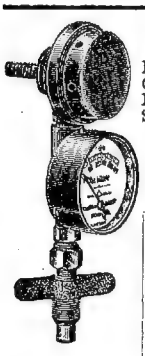

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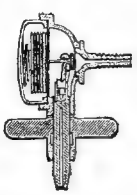

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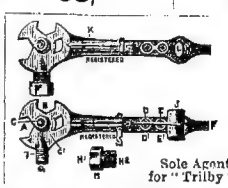

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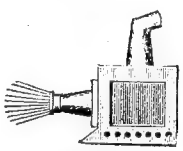

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# The Optics of Trichromatic Photography.—Part VI.

THE TRAILL TAYLOR MEMORIAL LECTURE.

*Continued from page 48.*

In March, 1894,* C. Nachet, of Paris, patented a device in which two of the images were blended to the right eye by the aid of a thinly silvered or platinised mirror, and the third image, made from a different view point, was seen directly with the other eye. This was an attempt to make a combined photo-chromoscope and stereoscope; but, owing partly to the fact that very few people (if any) can successfully "blend" two primaries through two eyes, it was soon abandoned. This idea, first published by M. Nachet, is fully set forth in the mémoire attributed to Louis Ducos du Hauron as of the date July 14, 1862, but first published in 1897; nevertheless, it is credited to Nachet on page 360 of the same book in which it first appears as belonging to Louis Ducos du Hauron in 1862.

In September, 1894, Carl Zink, of Gotha, published a description of a photo-chromoscope having three rectangular "steps," and two transparent and one ordinary silvered mirror, and a "cosmorama" lens. The new features in this device were the horizontal disposition of the steps, inclination of the mirrors in the horizontal plane, and all disposed to reflect from their upper surfaces, and an adjustment of angle to secure the best direct illumination of the reflected images. A horizontal disposition of the three mirrors had never before been published, although it appears in the Du Hauron 1862 mémoire already referred to, with one of them disposed to take the reflection from the under side. Zink's publication was anticipated by my application for a patent upon the same and several other important improvements in the "step" photo-chromoscope with transparent mirrors. My patent application, dating July 3rd, 1894,† discloses not only the arrangement shown by Zink, but (1) an efficient contraction to two steps instead of three, whereby the apparent area of the picture is nearly doubled, (2) the use of coloured glass reflectors by which doubling of outlines is avoided without the use of convex lenses or "thin silvering,"‡ and the construction and adjustment proportionately simplified, (3) a stereoscopic construction, whereby the illusion of reality is brought to perfection, (4) a modification by which the images are disposed in line upon a single plate.

None of these ideas had been published before my dates of record.

Some months after the publication of my patent, Nachet claimed the same construction on the strength of a clause in his patent which was to the effect that two transparent mirrors instead of one could be used in his three-image stereo-chromoscope. The natural inference from the wording of this clause was that he meant one in front of each eye, the construction since adopted in the "Kromaz," and not an arrangement involving a totally different idea like my own. Even if it is assumed that he may have meant that two transparent mirrors could be used in front of one or both eyes, the fact that he so disposed his transparent mirror as to reflect from *below* proves conclusively that he had then no thought of direct lighting of the reflected images and the use of a folding chromogram, which I patented and which he reproduced, along with other details shown in my patent drawings, such as a tray base and strut for fixing the inclination, months after the publication of the patent.

Inclination of the mirrors in a horizontal plane, with the reflections taken from the upper surfaces, and the three images disposed in line upon one plate, patented and first published by me, also appears in Du Hauron's melano-chromoscope.

As before stated, inclination of the mirrors in a horizontal plane, *but at opposite angles*, is disclosed in the Du Hauron 1862 mémoire. It is remarkable that the three-image stereoscopic construction patented by Nachet in 1894, a stereoscopic construction with three pairs of images, a two-step construction, methods of stereoscopic projection, and other ideas first made public by others, appear in this mémoire, and are first published as Louis Ducos Du Hauron's inventions twenty-eight years after he was challenged by Charles Cros to show a record antedating Cros's sealed mémoire of 1867. Du Hauron's reply to this challenge appeared in *Cosmos*, July 24, 1869, when he said, "I myself could have, at the conception of my idea [which he then dates back '*five or six*' years] consigned its generalities to a sealed letter . . . . I gave up to the higher ambition to give to society and to France a system of heliochromy sufficiently elaborated," etc. This is his reply in 1869, *seven* years after it is now stated that he had prepared expressly for presentation to the Institute of France a mémoire of nearly 3000 words, describing a remarkably elaborate system, and that this mémoire was duly acknowledged and commented upon by M. Lélut, and read by at least one other member of the Institute, preserved all this time, and even now referred to as a "publication" in 1862. Although it may be inferred that his failure to get his mémoire presented to the Institute decided him to try to reduce the method to successful practice before trying again, it would seem most natural that he should have produced such conclusive proof of priority in reply to Cros if he was able to do so.

It is quite probable that the inconsistencies which I have noted may be satisfactorily explained away, but it seems proper, under all the circumstances, to raise the question, and I hasten to say that, for reasons well known to many, this can be done without questioning the integrity of Louis Ducos Du Hauron. I don't think the question would have been raised in my own mind if I had not already regularly found my own published ideas reappearing in France as French inventions, dated back without evidence, and my own publications totally ignored.

My 1894 "two-step" photo-chromoscope (to which I have given the distinctive name Kromskop) has never been rivalled by any other form of viewing device, and has been finally perfected by two "improvement" inventions.

As originally constructed, it was found that the inclination of the transparent reflectors between the eye and the green image introduced such a distortion of that image that the red and blue images, reflected from plane surfaces, could not be perfectly superposed upon it. The reason for this can be readily shown by tracing the path of the rays from the top and bottom of the green picture to the eye, both direct and as changed by refraction through the inclined transparent mirrors, the amount of distortion depending upon the thickness of the glasses;

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* French Patent No. 237,394, March 29, 1894.

† U.S. Patent No. 531,040, published December 18th, 1894.

‡ The possibility of employing coloured glass reflectors was first disclosed in my U.S. Patent No. 475,084, published May 17th, 1892; but the particular relation of the colours of the glasses to the respective images was first published in the *Journal of the Society of Arts*, May 19th, 1893, p. 666, and patented in the U.S. in 1894. In his treatise published in 1897, Alcide Ducos Du Hauron publishes this for the first time as a proposition of his own; and it is only one of many ideas which have been claimed by Du Hauron only after they had been published or patented by others. Even Clerk-Maxwell and Harry Collen are totally ignored in this book.

but I need not take up time with such a demonstration here. Suffice it to say, that I soon found two ways of correcting this defect, both of which were rather unsatisfactory from the manufacturer's point of view. One was to employ slightly wedged reflectors, so disposed as to correct the distortion, and the other was to introduce a similar distortion in the reflected images by attaching springs to the reflectors, so as to make the reflecting surface slightly cylindrical.* The first method, although efficient, called for weakly prismatic glasses, which cannot be obtained of sufficiently uniform accuracy by commercially practicable methods of grinding and polishing. The second method, although quite practicable in a commercial manufacture, is less perfect, and somewhat clumsy and troublesome. The final solution of the problem, a most obvious one when you come to think about it, was the introduction of a plane glass under the red image, equal in thickness to the sum of the two transparent mirrors, and inclined at the same angle.† This leaves the blue image uncorrected, but the error is only one-half what it would be in the red, and is of far less critical importance in the result, so that the image is now satisfactory to the eye. A kromskop made up without this compensation would now be instantly condemned.

Another defect which troubled me for a long time grew out of the fact that the coloured glass reflectors have polarising properties, while the silvered mirror which illuminated the green image did not have this property. With a grey sky as a source of illumination this did not much matter, but with a polarised blue sky the amount of light reflected by the transparent mirrors of the red and blue images varied with the angle of polarisation, so that an instrument which gave a bluish-white field when pointed to a portion of the sky near to the position of the sun, would give a yellowish-green field when pointed in a different direction, towards a part of the sky which appeared still bluer to the eye. The amount of light reflected from the silvered mirror was the same for all positions, but the amount reflected by the transparent mirrors sometimes varied enormously. There are half-a-dozen ways in which this defect can be lessened, but it is now eliminated by substituting a bundle of glasses for the silvered reflector in front of the green image.

The fields of the kromskop also became green by reason of the light gradually darkening the red screen, and this defect has been remedied by employing a different colouring material.

With these and other detail improvements, the performance of the kromskop is perfect, and, although the public is slow to appreciate its value and importance, it is coming into use in the United States in the fields of entertainment, art, medicine, and commerce, and will probably be regarded as a necessity for many purposes in course of time, as it is the only means of producing perfect visual reproductions of thousands of objects.

Another form of the instrument, which I call the "miniature" kromskop,‡ is a modification of one of the plans of construction which I showed in the original patent, permitting of disposing the three images in a line upon a single plate. To simplify the construction, images of the kromogram are looked at obliquely, and the consequent distortion corrected by introducing a prismatic lens and a 7° prism. This construction is practically very much cheaper than anything else that has been proposed, and the images, although small, appear larger than in the far more costly melano-chromoscope, which Du Hauron has produced by grafting some of the same ideas upon his original conception. Probably, I should say, which Alcide Ducos Du Hauron has produced by grafting some of my ideas upon his brother Louis Ducos Du Hauron's original conception.

With the exception of the "miniature" kromskop, all the forms of photo-chromoscope can be adapted for making the photographic colour records; but not one of them is a desirable construction for a camera, and no one who knows all the requirements will waste his time trying to make them interchangeable. Even if the general plan was suitable for both purposes, it would be both better and cheaper to construct two instruments, one specially adapted for each purpose, than to provide all the substitutions and readjustments necessary to make a single one efficiently interchangeable. This conclusion has been forced upon me after making several interchangeable instruments myself, and examining those which have been made by others.

Moreover, the most efficient viewing instrument is the kromskop, with images in three planes, and no camera for making kromskop pictures will ever prove permanently satisfactory unless the three images are produced upon a single plate. I am so sure of this that I would feel justified in ignoring all three-plate cameras, but for the fact that the construction of some of them involves ideas which also enter into the one-plate cameras, and have had a part in their evolution.

The idea of employing as a camera an instrument essentially like the kromskop, with dark slides attached, is a favourite one with many; but, besides the objections to trying to make such an instrument efficiently and conveniently interchangeable, and the objection to trying to use three separate sensitive plates, it has some very serious optical defects as a camera. In the first place, the illumination of the images will be uneven, because the amount of light reflected from a transparent mirror varies with the angle of incidence, which differs for different parts of the cone from the objective, and the illumination of the images formed by rays reflected from the transparent mirrors is greatest just where it is weakest in the image formed by transmitted rays, or by reflection from a succeeding silvered mirror. In the second place, the proportionate illumination of the three images necessary to make the exposure required equal for the three plates cannot be readily controlled except by the use of compensating screens at the objective, which are almost certain to upset the selective absorption, especially if in the form of a parti-coloured adjustable diaphragm aperture.

In the third place, the polarising properties of the transparent mirrors will under some circumstances introduce serious errors in the colour record. This is an important matter, of which I shall speak again. Here are five counts against trying to make an efficient camera out of an efficient photo-chromoscope.

Louis Ducos Du Hauron divorced cameras and viewing instruments at an early date.* He originated the method of controlling the relative degree of illumination of the three images by employing three objectives and three separately adjustable diaphragms, a principle which I once thought belonged to me; but he does not appear to have recognised the necessity of correction for unevenness of illumination across the images, which I accomplished by inclination of the diaphragms in the optic axis. This may appear to be a small matter, but the absence of such correction really constitutes a fatal defect.

* U.S. Patent No. 622,480, published April 4th, 1899.

† U.S. Patent No. 635,253, published October 17th, 1899.

‡ *Journal of the Photographic Society of Philadelphia*, March, 1900, p. 20.

* British Patent No. 2,973, July 22nd, 1876.

# PATENT INTELLIGENCE.

*The following List, relating to current Patent Applications, is compiled expressly for the "Optical Magic Lantern Journal" by W. P. Thompson & Co., Patent Agents, of 322, High Holborn, London, W.C., to whom all enquiries for further information should be addressed.*

No. RECENT PATENT APPLICATIONS.

3772. 21st February, 1901. Cornelius Horn. Photo-phonograph.

3989. 25th February, 1901. E. D. Fawcett. A method of contact printing in colours directly from transparent coloured positives, photographic or other.

4161. 26th February, 1901. Henry William Hamblin Palmer. Improvements in apparatus for photographing and exhibiting animated or ordinary pictures.

4353. 1st March, 1901. Charles Walter McLaughlin. The separate rollable photo film.

4420. 1st March, 1901. James Emerson Reynolds and George Rudolf Grubb. Improved production of films on plate glass and other transparent bodies.

4421. 1st March, 1901. James Melling. Improvements in holders for displaying photographs and the like.

4531. 4th March, 1901. Abraham Hart. Improvements in and relating to the production of photographic pictures on glass or any other transparent medium.

4900. 7th March, 1901. Leopold Breton. Improvements in apparatus for exhibiting series of photographic or other pictures in succession, particularly applicable for exhibiting animated pictures.

5174. 12th March, 1901. Frederick Hopkinson and Leonard Charles Hopkinson. Improvements in cinematographs and similar animated picture apparatus.

5328. 12th March, 1901. William Henry Alexander. A device for use with snapshot cameras.

5407. 14th March, 1901. George Alfred Hide. Improvements in means for obtaining photographs for cinematographic displays.

5605. 18th March, 1901. Oscar Scholzig. (Arold Valentin Christiani-Mayall, France.) Improvements in automatically feeding magic lanterns.

5614. 18th March, 1901. Ernest Samuel Jordan. An improved magazine camera with detachable plate changing box.

6930. 2nd April, 1901. Edwin Drew Bartlett and George Houghton. Improvements in and relating to view finders for photographic cameras and the like.

7650. 13th April, 1901. Achille Victor Emile Daubresse. Improvements relating to cinematographs.

*Copies of the following specifications may be obtained by remitting 1/- for each specification to W. P. Thompson & Co., Patent Agents, 322, High Holborn, London, W.C.*

SPECIFICATIONS PUBLISHED.

4011 of 1900. Wallis. Portable screen frame apparatus for lantern views and similar purposes.

22954 of 1899. Granichstaedten. Kinematographs.

5646 of 1900. Doyen. Apparatus for use in viewing cinematographic or other pictures.

8415 of 1900. Munsterberg. Means of obtaining intense heat for limelight or other purposes.

22981 of 1900. Brown and Beaumont. Kinematographs and magic lanterns.

7035 of 1900. Huet and Daubresse. Cinematoscopic, cinematographic, chronophotographic, and chromophotographic apparatus.

8869 of 1900. Simonis. Trough for developing or fixing a number of photographic plates simultaneously.

9739 of 1900. Schmidt and Haensch. Kinematographs and like photographic serial apparatus.

6029 of 1900. Taylor. Lens mounts for photographic cameras.

8674 of 1900. Imray. (A. Luino & Co.) Photographic apparatus for taking panoramic views.

# Correspondence.

## THE NOTTINGHAM LIME CYLINDER COMPANY.

*To Mr. J. Hay Taylor, Editor.*

DEAR SIR,—With reference to your remarks in the last issue concerning the above, kindly allow me the privilege of an explanation in justice to myself and those gentlemen whose names you mention in connection with testimonials, and many others who in the past gave me such generous support and appreciation of the goods I then supplied. I personally founded this business in January, 1891, trading as "T. S. Whitehall & Co." In December, 1897, I was joined by Messrs. Geo. Wigley & Son, of Nottingham, as partners, and in the following June opened the premises in Egerton Street, Nottingham, as The Incandescent Lime Co., but a dissolution occurred in December, 1898. The business was sold to some London purchasers who attempted to form a syndicate, and it has remained in their hands more or less ever since; from that time I have had no partnership or interest in it whatever, or have I rendered any assistance to the purchasers, or the various combinations through whose hands it has since passed, which include the late Incandescent Lime Cylinder Syndicate, Ltd., 385, Old Kent Road, The Nottingham Lime Cylinder Co., Ltd., 150, Fleet Street, and the present Nottingham Lime Cylinder Co., 130, Stamford Street, London, S.E. The works were closed after the dissolution of partnership, and only re-opened a few weeks ago, by persons whose names I cannot ascertain, and who constitute the company. Printed copies of my testimonials, no doubt being found upon the premises, have been distributed broadcast through the trade. I now, in the

interests of Messrs. Locke, Haigh, Woodruff & Malden, dispute the right of these persons, whoever they may be, to use the said testimonials which were written to me personally by these gentlemen, and I have now in my possession some of the originals. Furthermore, I have absolute proof that the lime they are now using in their manufacture is not from the same source as that used by me three years ago. I now publicly request these people to withdraw these testimonials.

Yours faithfully,
T. S. WHITEHALL.

2, Lavender Street,
Nottingham.

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## "LATE OF THE ROYAL POLYTECHNIC INSTITUTION."

*To Mr. J. Hay Taylor, Editor.*

DEAR SIR,—I have been much amused by an article under the above title in your April number. *If* there are any lecturers or operators at the present time so ill-advised as to put "Late of the Royal Polytechnic" after their names, let me counsel them to discontinue doing so without delay. The "Poly" came to grief in 1882; few of the staff even at that time were "chickens," or it might have been better for the institution. There were many, doubtless, who, during its existence, traded upon their connection with the "Poly," but it is difficult to understand what advantage it could possibly be *now*. During the last twenty years science and education have made rapid strides; many things then regarded as mysterious could now be easily explained by an average schoolboy—pictures that then were considered "wonderful" would now be considered "very ordinary" indeed; and I fail to see what any sane individual could now possibly expect to gain by claiming to have been connected with the poor old "Poly." As to "others being unable to secure the favourable attention of the public by their own unaided endeavours bedecking themselves in the borrowed plumes of the Royal 'Polytechnic,' and the fable of the 'Ass in the Lion's Skin'"—twaddle. *If* any entertainers advertising now really had anything to do with the old institution, they had better *conceal* the fact, or their chances of engagements will be extremely small.

Yours truly,
FOOTLIGHTS.

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*To Mr. J. Hay Taylor, Editor.*

DEAR SIR,—Anent the topic which has lately appeared in the OPTICAL MAGIC LANTERN JOURNAL relative to certain persons styling themselves "late of the Royal Polytechnic," I may mention that there are quite a number of lanternists who put after their names "late of the Polytechnic." On investigation, I find that this means that they have had an engagement at one of the now many Polytechnics which are in existence. True it would have been more honest on their part had they been a little more explicit, and put, for instance, late of the Borough Polytechnic. Late of "The" Polytechnic to the past generation meant something wonderful, something very scientific, something Pepper's ghostified; but nowadays to the present generation, we young men look upon late of this or that as something which may or may not be exactly true, but which serves the purpose of a stimulating advertisement. Things will not bear too strict an enquiry nowadays—from the Government downwards.

Yours truly,
"JUST OF AGE."

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## Notes and Queries.

*Amateur Slide Maker.*—We know nothing of the preparation you mention, the name is only a trade name. Instead of the varnish you have been using try some Damar varnish and allow it to remain some considerable time before completing the operation of stripping. Supplies may be obtained from Ed. Liesegang, Dusseldorff, Germany.

*Jas. S. Lawson.*—We think that Messrs. Newton & Co. are the most likely firm to supply you with slides for your special lecture. They make a speciality of such subjects.

*Theo. Brown.*—Thanks for the model of the silhouette slide which appears in this issue. We have tried it and it looks excellent on the screen.

*A. C. Furnas.*—The lenses about which you enquire are good value for the money, they are mostly of French make, but some are better than others, although all look practically the same. With lenses by the high-class makers in this country, *i.e.*, those who put their names on, you can depend on everyone, as each is tested individually. We have a Darlot, but would not think of exchanging it on any point for the make first mentioned. With Beard's dissolving carrier the working is as follows:—Immediately beside the slide showing on the screen the second slide is slipped, the first is then withdrawn, and the second immediately jumps into the exact focus. The movement is very quick. A pneumatic carrier was some time ago introduced by Hudlass & Son, of Southport. A translucent shutter gives a blink in front of the lens, and during that blink the slide changes in the carrier, which is of the sliding style. A slide is placed in the end of carrier during the time one is being shown. When ready for the change a ball is squeezed, the light gives a blink, and another picture has taken the place of the first. We believe the apparatus costs 17s. 6d. The effect is good. We note your remarks about the Chicago firm having brought out a new lamp. You will see we were quite up to date in the matter, for when your letter arrived our last issue had gone to press and it contained full details and sketch. We shall be pleased to hear from you again, note our private address on the first page of this issue.

*F. Bramwood.*—We are sorry we are unable to give the address of the firm asked for.

*W.*—Your letters to hand. The history is most peculiar.

*R. T.*—We are unable to supply the address, as the gentleman about whom you enquire died at the Charterhouse last year. He has done no business for many years.

*Mrs. B.*—According to merit we should arrange in the following order:—3, 1, 5, 4, 2.

*Professor.*—We note that you take exception to our stating that acetylene gas will not answer for public cinematographic exhibitions, and that you say it will illuminate an 8 feet cinematographic picture. True, it will *illuminate* it, but the illumination will be a very sad affair. We must adhere to what we said on the subject.

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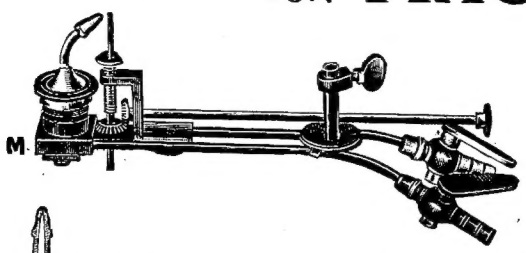


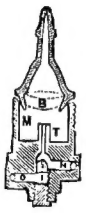


This is the only Mixed Gas Jet which will work at full power with coal gas taken direct from the town supply, and oxygen from a cylinder. In order to effect this the oxygen, on its way to the mixing chamber, is made to pass through the small Injector I in the sketch at a pressure of about 12 lbs. per square inch. In passing through the Injector it sucks a supply of coal gas from the pipe **H**, which is connected with the house pipe, and forces it forward through the short pipe T into the mixing chamber M. Here the mixed gases meet the baffle plate B, which has the two-fold effect of silencing the passage of the gases, and ensuring their complete admixture. The mixed gases then pass through holes in the edge of the plate, and so to the burner. The requisite pressure of oxygen is obtained in the ordinary way by a fine tap on the cylinder, or an automatic regulator fitted with a high-pressure spring to deliver at about 15 lbs. pressure.

Five seasons' experience has fully established the superiority of this Jet over all others. It will yield **THE FULL 1,800 TO 2,000 CANDLE-POWER** (so-called) of the ordinary mixed jet when taking its supply of coal gas direct from the town's pipe, or even from a bag *without any pressure at all.* If a town's supply is not available, it will work just as well with coal gas from a cylinder. We cannot see why ordinary mixed jets should be purchased which cannot offer these alternatives. As for blow-through jets, ejector or otherwise, we do not know why they should be used at all, when with the same economy and convenience of working, the Injector Jet will give two or three times the light. By removing the Injector nipple the jet becomes an ordinary mixed jet. This can be done whenever it is desired to work with oxygen at low pressure, and coal gas from a cylinder.

The working of the Jet is simpler than that of an ordinary jet. When the H tap is once adjusted, it does not need to be touched again when using town's gas. The turning off or on of the oxygen supply regulates automatically the supply of coal gas. This is a great convenience in actual use.

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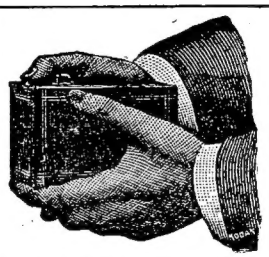

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MELBOURNE: KODAK, LTD., 284 Collins Street. ROCHESTER, NEW YORK, Eastman Kodak Co.


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